



Barrier requirements as the evolutionary "driver" of epidermal pigmentation in humans

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Abstract:

Current explanations for the development of epidermal pigmentation during human evolution are not tenable as stand-alone hypotheses. Accordingly, we assessed instead whether xeric- and UV-B-induced stress to the epidermal permeability barrier, critical to survival in a terrestrial environment, could have "driven" the development of epidermal pigmentation. (1) Megadroughts prevailed in central Africa when hominids expanded into open savannahs [approximately 1.5-0.8 million years ago], resulting in sustained exposure to both extreme aridity and erythemogenic UV-B, correlating with genetic evidence that pigment developed approximately 1.2 million years ago. (2) Pigmented skin is endowed with enhanced permeability barrier function, stratum corneum integrity/cohesion, and a reduced susceptibility to infections. The enhanced function of pigmented skin can be attributed to the lower pH of the outer epidermis, likely due to the persistence of (more-acidic) melanosomes into the outer epidermis, as well as the conservation of genes associated with eumelanin synthesis and melanosome acidification (e.g., TYR, OCA2 [p protein], SLC24A5, SLC45A2, MATP) in pigmented populations. Five keratinocyte-derived signals (stem cell factor-->KIT; FOXn1-->FGF2; IL-1alpha, NGF, and p53) are potential candidates to have stimulated the sequential development of epidermal pigmentation in response to stress to the barrier. We summarize evidence here that epidermal interfollicular pigmentation in early hominids likely evolved in response to stress to the permeability barrier.

Source: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3071612>

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Meteorological Factors, Solar Radiation

Extreme Weather Event: Drought

Geographic Feature:

resource focuses on specific type of geography

General Geographical Feature

Geographic Location:

Climate Change and Human Health Literature Portal



resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Resource Type:

format or standard characteristic of resource

Research Article, Review

Timescale:

time period studied

Historical